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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/660,390	09/12/2000	Akihiro Nitayama	00629.00002	6915

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EXAMINER

WEISS, HOWARD

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 12/30/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/660,390

Applicant(s)

NITAYAMA ET AL.

Examiner

Howard Weiss

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 August 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-12 and 18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-12 and 18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

Attorney's Docket Number: 00629.00002

Filing Date: 9/12/00

Continuing Data: CIP of 08/982,478 (12/2/97) Now U.S. Patent No. 6,236,079

RCE established 8/1/02

Claimed Foreign Priority Date: none

Applicant(s): Nitayama et al. (Katsuhiko, Ishibashi, Kohyama)

Examiner: Howard Weiss

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/1/02 has been entered.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 12 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Park et al. (U.S. Patent No. 5,521,115).

Park et al. show all aspects of the instant invention (e.g. Figures 2 to 10) including:

- a semiconductor substrate **10**

- an element isolation insulating film including a first insulating film **56** buried to define an active element area and a second insulating film **80** shallower, wider and position over the first film
- elements including a capacitor node **55** formed in a trench **22**
- contact layer contacting **55'** said node and **26** an under side of the second insulating film and a side the first insulating film.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 2 and 6 to 10 are rejected under 35 U.S.C. § 103(a) as obvious over Park et al. and Lu (U.S. Patent No. 5,843,820).

Park et al. show most aspects of the instant invention (Paragraph 3) including:

- a semiconductor substrate **10**

- a plurality of trench capacitors with node layers **55** and arranged at a regular pitch
- a semiconductor layer comprising a first layer **32** and a second layer **58** formed on said first layer
- an element isolation insulating film **30** buried in said semiconductor layer and defining active element areas over two adjacent trench capacitors
- two transistors **14** which share one **18** source/drain diffusion layer and an other **20** source/drain layer
- each transistor's gate **16**, **62** connected a word line continuous in one direction
- a contact layer **26** for connecting the other source/drain layer to the node layers and bit line contacts **78**

Park et al. do not explicitly show bit lines intersecting the word lines. However, it is common in the art to form bit lines to intersect word lines and Park et al. generally state that it is left to one of ordinary skill to construct such lines (Column 8 Lines 54 to 61).

Park et al. do not show the other source/drain layer positioned over said trenches. Lu teaches (e.g. Figure 12) to form source/drain layer **17** over a trench capacitor node **50** and to have the contact layer **66** buried in said substrate **40** to increase capacitor capacitance (Column 4 line 40 to 44). It would have been obvious to a person of ordinary skill in the art at the time of invention to form source/drain layer over a trench capacitor node and to have the contact layer buried in said substrate **40** as taught by Lu in the device of Park et al. to increase capacitor capacitance.

6. Claim 11 is rejected under 35 U.S.C. § 103(a) as obvious over Park et al. and Lu, as applied to Claim 2 above, and in further view of Bronner et al. (U.S. Patent No. 5,606,188).

Park et al. and Lu show most aspects of the instant invention (Paragraph 5) except for the substrate isolation insulating film made of two films as claimed. Bronner et al. teach (e.g. Figure 1) to make two layer isolation films **14,16** as claimed to allow scalability below 2 volts (Column 1 Lines 43 to 45). It would have been obvious to a person of ordinary skill in the art at the time of invention to make two layer isolation films as taught by Bronner et al. in the device of Park et al. and Lu to allow scalability below 2 volts.

7. Claims 3 to 5 are rejected under 35 U.S.C. § 103(a) as obvious over Park et al. and Lu, as applied to Claim 2 above, and in further view of Ishii (U.S. Patent No. 5,250,831).

Park et al. and Lu show most aspects of the instant invention (Paragraph 5) except for the trench capacitors shaped substantially in a square with sides equal to $2F$, either the diagonals or the sides of said squares being oriented in two orthogonal directions of said word and bit lines and arranged at the pitch as claimed. Ishii teaches to have trench capacitors **8** in a square configuration and the diagonals (Figure 7) or the sides (Figure 5) of said squares being oriented in two orthogonal directions of said word **20b** and bit **20a** lines to achieve high integration of the memory cells in a DRAM (Column 3 Lines 29 to 31). It would have been obvious to a person of ordinary skill in the art at the time of invention to have trench capacitors **8** in a square configuration and the diagonals (Figure 7) or the sides (Figure 5) of said squares being oriented in two orthogonal directions of said word and bit lines as taught by Ishii et al. in the device of Park et al. and Lu to achieve high integration of the memory cells in a DRAM.

In reference to the dimensions of the sides of the trench capacitors, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the dimensions of the trench capacitors equal to the minimum processing dimension, since it has been held that discovering an optimum value of a

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result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Response to Arguments

8. The Applicants' arguments with respect to Claims 2 to 12 and 18 have been considered but are moot in view of the new ground(s) of rejection.

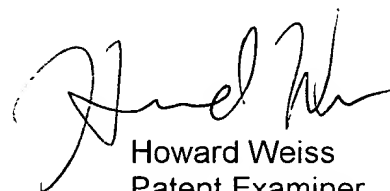
Conclusion

9. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. Papers should be faxed to Art Unit 2814 via the Art Unit 2814 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications. The official TC2800 Before-Final, **(703) 872-9318**, and After-Final, **(703) 872-9319**, Fax numbers will provide the fax sender with an auto-reply fax verifying receipt of their fax by the USPTO.
10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard Weiss at **(703) 308-4840** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via **Howard.Weiss@uspto.gov**.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group 2800 Receptionist at **(703) 308-0956**.

11. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/ 301, 305	thru 12/23/02
Other Documentation: none	
Electronic Database(s): EAST, IEL	thru 12/23/02



Howard Weiss
Patent Examiner
Art Unit 2814

HW/hw
24 December 2002